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### Dissection of a frog or a toad

A toad or frog is one of the animals whose anatomy, physiology and ecology are studied for UACE biology exams. The other animals include a rat and cockroach

Note that the anatomy, physiology and ecology of the two animals is very similar that for examination purpose, a toad and a frog are used interchangeably.



Frog



Toad

## **Classification**

**Domain: Eukarya**

- **membrane bound nuclei**
- **has membrane bound cell organelles such as nuclei.**
- **complex cellular activity.**

**Kingdom: Animalia**

## **Justification**

- (i)
- (ii) A frog or toad has limbs for locomotion; this distinguishes it from fungi. Fungi are heterotrophic, multicellular but a fungus does not move from one place to another.
- (iii) A frog or a toad has a mouth for heterotrophic nutrition; this distinguishes it from plants that make their own food.

**Phylum: Chordata**

## **Justification**

- (i) A toad is bilaterally symmetrical i.e. it can be cut into half once



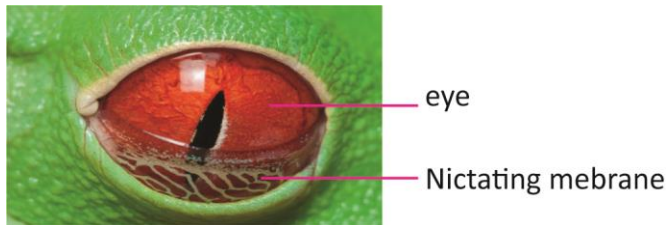
Line of symmetry

- (ii) A frog has got a brain case or skull for the brain
- (iii) A toad has got a back bone that can be felt when one touches the dorsal side of the toad.

### Class: Amphibia

#### Justification

- (i) It has got a moist skin that lacks scales
- (ii) It has got external eardrum
- (iii) It has got nictitating membrane



A frog's nictitating membrane is a transparent, or translucent, third eyelid that acts like built-in goggles, protecting their eyes from debris while swimming or resting and keeping them moist on land. This specialized membrane allows frogs to maintain vision while simultaneously shielding their eyes from harsh elements, playing a crucial role in their survival in both aquatic and terrestrial environments.

(iv) It has got a mouth with wide gape



mouth with wide gape

Order: Anura

Justification



lacks a tail  
hind leg

- (i) It has got long and prominent hind limbs
- (ii) Lacks a tail

Habitat

A toad and frog stay in damp places near water bodies. They lay their eggs in water. The toad or frog use water for external fertilization

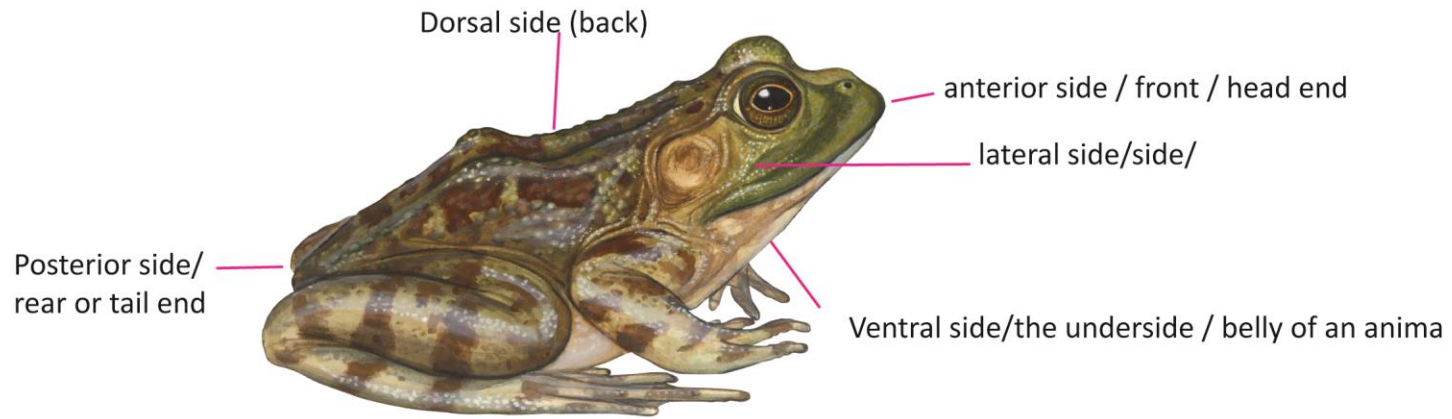


### Feeding

A toad or frog feeds on worms, insects, and grass

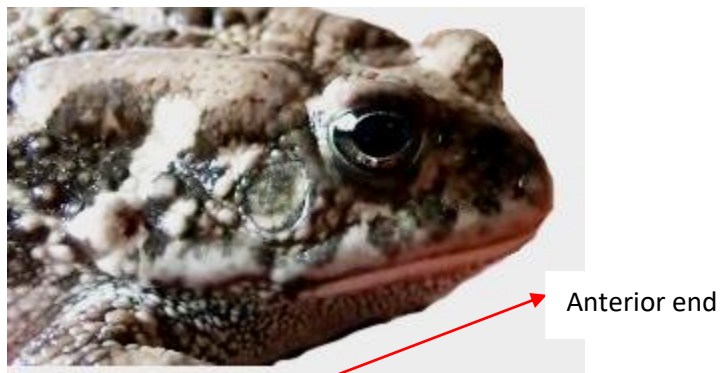


## Anatomical Terminology of toad



## External features

The head is triangular tapering anterior.



This give a toad a streamline shape, reducing friction during movement.

The head is dorso-ventrally flattened to enable the toad easily crawl under the stone where it hides away to avoid predators

Its prominent sensory organs and specialized jaw and swallowing mechanisms are essential for hunting and survival.

### **Dimensions of the head**

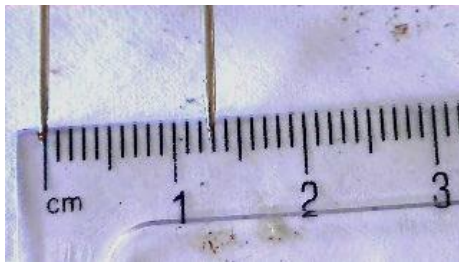
Not that the ruler measures to 1 decimal place in centimeters and no decimal place in millimeters

### **Thickness**

Measure the thickness using a divider like this.



From the ruler the thickness is 1.3cm, centimeter is small “c” small “m”



### **Width**

Measure the width like this.



Fro

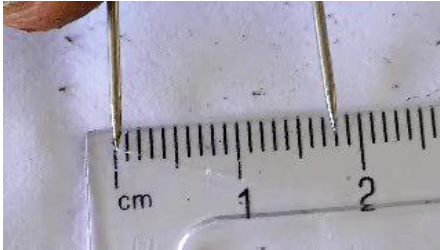


### Length

Measure the length like this.



From the ruler, it is 1.8cm

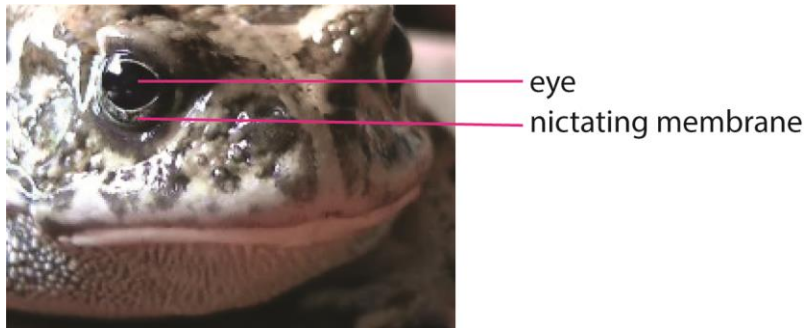


It should be noted that the length and width of the head of the toad or frog are approximately twice the thickness.

### The eyes

#### Structure

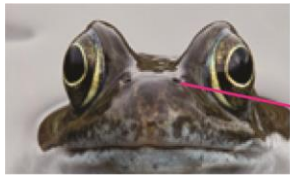
1. The eyes are oval, large, protruding; dorso-ventrally located to give the animal a wide field of view.
2. The eyes are covered by nictitating membrane that secretes fluid which lubricates and protects the eye during swimming.



### The nostrils

They are two oval holes, dorso-anteriorly located on the head

The location allows the frog to be submerged and leaves the nostril out of water for gaseous exchange.

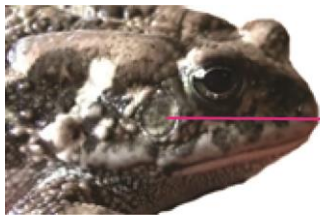


nostril

It should be noted that during the breeding season, the toad requires a lot of energy and therefore oxygen. Air is richer in oxygen than water.

### The ear

The ear is a circular patch of ear drum or tympanic membrane laterally located on the head



eardrum

Function: to collect sound waves

### Adaptations of the eardrum to its functions

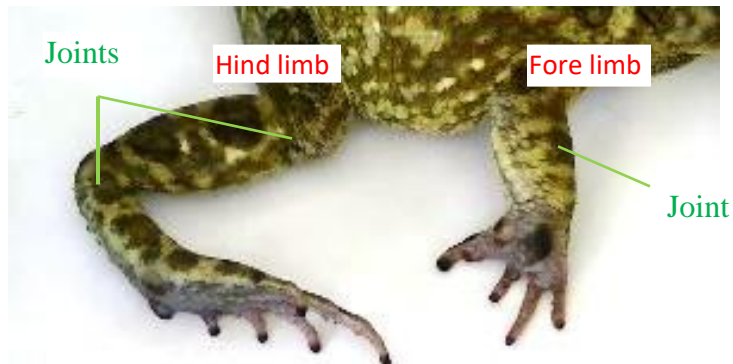
The eardrum is large and externally located to increase sensitivity to sound waves.

Lack of pinna eliminates the drag force that would be created.

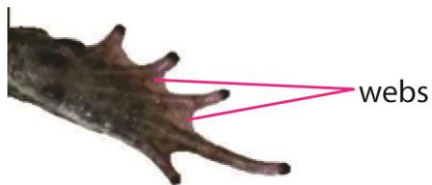
### The limbs

Sometimes you are required to draw the hind and fore limbs to the same magnification

At the same magnification, the hind limb is longer, has a muscular thigh, two prominent joints and five digits.



The hind limb has five digits and webs



Adaptive features of the hind limbs that enable the specimen to survive in its ecology.

- (i) Has a massive thigh to generate a repulsive force during hopping, walking or swimming.
- (ii) The hind limb has two prominent joints for flexibility during hopping and swimming
- (iii) The hind limbs have webbed digits to generate repulsive force during swimming.
- (iv) The hind limbs are long to increase flexibility during hopping

### Fore limb

The fore limb is short stout and has one prominent joint

The fore limb has no webs



Adaptive feature of fore limb of a toad

It is short and sturdy for support, balance, burrowing and firmly holding the female during mating

Forelimbs are jointed to absorb shock during landing



fore limbs provide support

A drawing of the fore and hind limb to the same magnification

Fore limb



Hind limb



Draw, name and memorize the parts

X1

### Comparison of the hind limbs of a toad and that of grasshopper in view of evolution

They are both long, muscular and used for hopping



Such organs that have different ancestral origin but modified to perform similar functions are termed as analogous structures. The type of evolution is called convergent evolution.

#### The skin

The skin is thin multicolored or mottled dorsally and white ventrally.



@

### Adaptations of the skin to its function

1. It is thin to facilitate gaseous exchange.
2. It dark and multicolored dorsally to camouflage from aerial predators
3. It is white ventrally to camouflage from aquatic predators.
4. The skin is tough to protect inner parts of the body.
5. It is moist to dissolve gases for easy gaseous exchange.

### Adaptations of the toad to its ecology or features that allow a toad to live a successful life

Anything that allows a toad to live a successful life can be given as its adaptations to its ecology.

1. It has eyes to see food.
2. Have limbs for locomotion to look for food, mates and run away from enemies.
3. Has eardrum to collect sound waves.
  
4. Has dark multicolored skin to camouflage from aerial predators.
5. Has streamline body for easy movement in water.
6. Has moist skin to facilitate gaseous exchange.
7. Has thin skin to facilitate gaseous exchange.
- 8.

### Sample questions

- 1 (a) Classify the specimen under the following taxa.
  - (i) Phylum
  - (ii) Class(b) Give reasons to justify the choices of the taxa in (a) above.
- 2 You may be required to measure the proportions of the head.

- 3 Describe the structure and adaptations of the following parts .i.e. eyes, skin, limbs, head and nostrils.
- 4 State way by which a toad is adapted to its ecology.

### **Internal structures**

Before we dissect note that:

1. The toad is dissected upside down, in this position its left is our right and our left side is its right. However, questions are usually specific whose side is meant whether yours or toad's.
2. Make sure you understand the question before you answer because any answer that does not answer the question does not carry any mark.

### **Marking points for dissection experiments**

- Ability to interpret the question. Failure begins improper interpretation of the question especially in relation to sides of the specimen (right or left).
- Ability to display the relevant (internal) parts
- Ability to draw displayed organs proportionally and professionally
- Clear labeling of organs with correct spelling of biological terminologies.

**Here below are the common dissection questions that are going to guide our exploration into the internal structure of the toad or frog.**

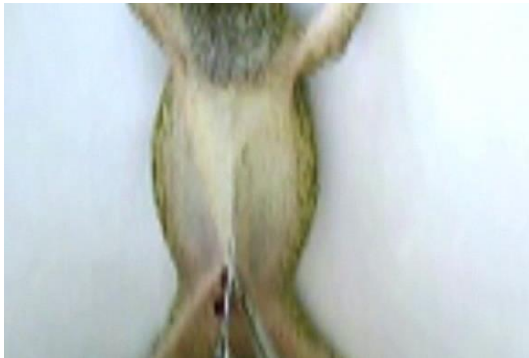
## Question 1

Place the frog ventral side uppermost and dissect to remove the skin

(a) Describe the attachment of the skin to the body wall.

### Observations

The skin is loosely attached to the ventral side of abdominal wall and tightly attached on the dorsal side.



### Significance of loose attachment of the skin on abdominal wall

1. Creates a fluid filled space for dissolution of gases.
2. Allow free distension of the abdomen.



(b) Describe the blood circulation to the skin

**Observation and significance**



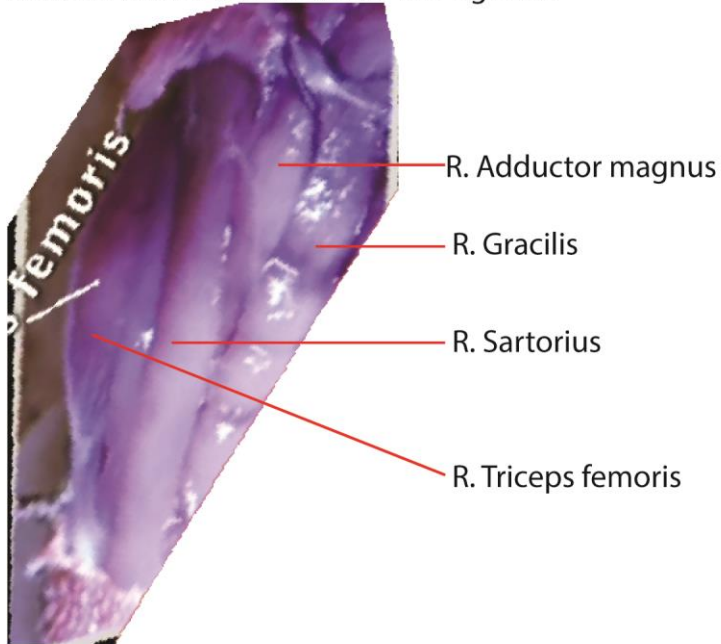
The skin is covered by a dense network of capillaries which join up to form main veins that return **oxygenated** blood towards the heart; this maintains a **high diffusion gradient** for efficient gaseous exchange.

**Question 2**

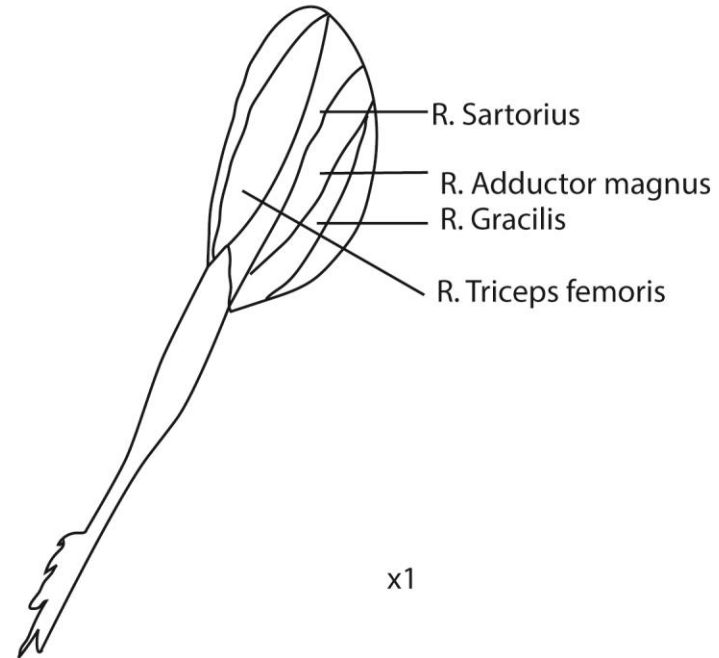
Remove the skin from the thigh to observe muscles on the ventral side of the right hind limb. Draw.

Note that exposing and drawing muscles on a different limb other than the one specified in the question leads to loss of marks.

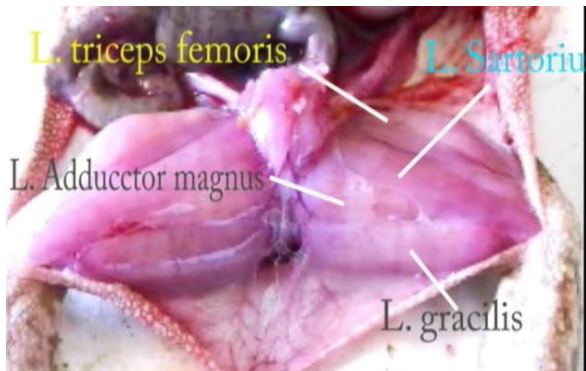
Muscles on the ventral side of the right hind limb



A drawing of superficial muscles on ventral side of the right hind limb



The prefix "right" is necessary because there are similar muscles on the left hind limb



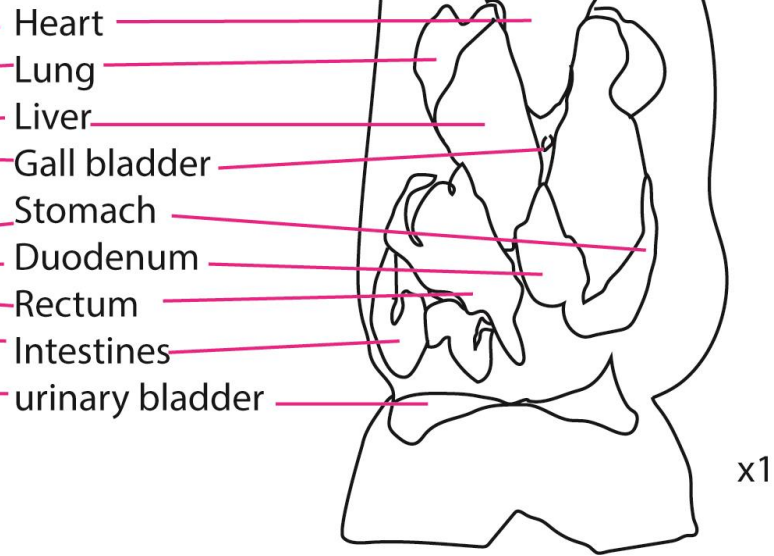
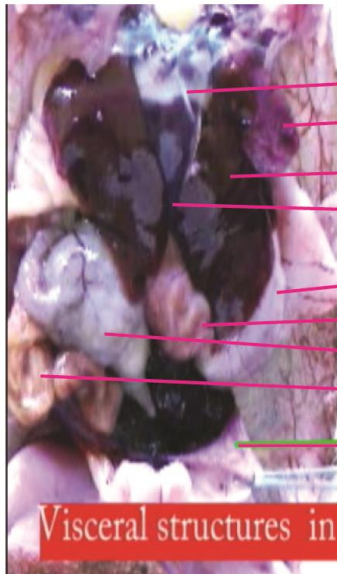
### Question 3

Dissect to expose visceral organs in the chest and abdominal region. Draw and label your dissection in undisturbed form.

\*Visceral refers to internal organs in the great cavities of the body that is chest and abdomen\*

A drawing of visceral structures in the chest and abdominal regions

Visceral structures in the chest and abdominal regions



#### Question 4

Open and draw structures in the buccal cavity

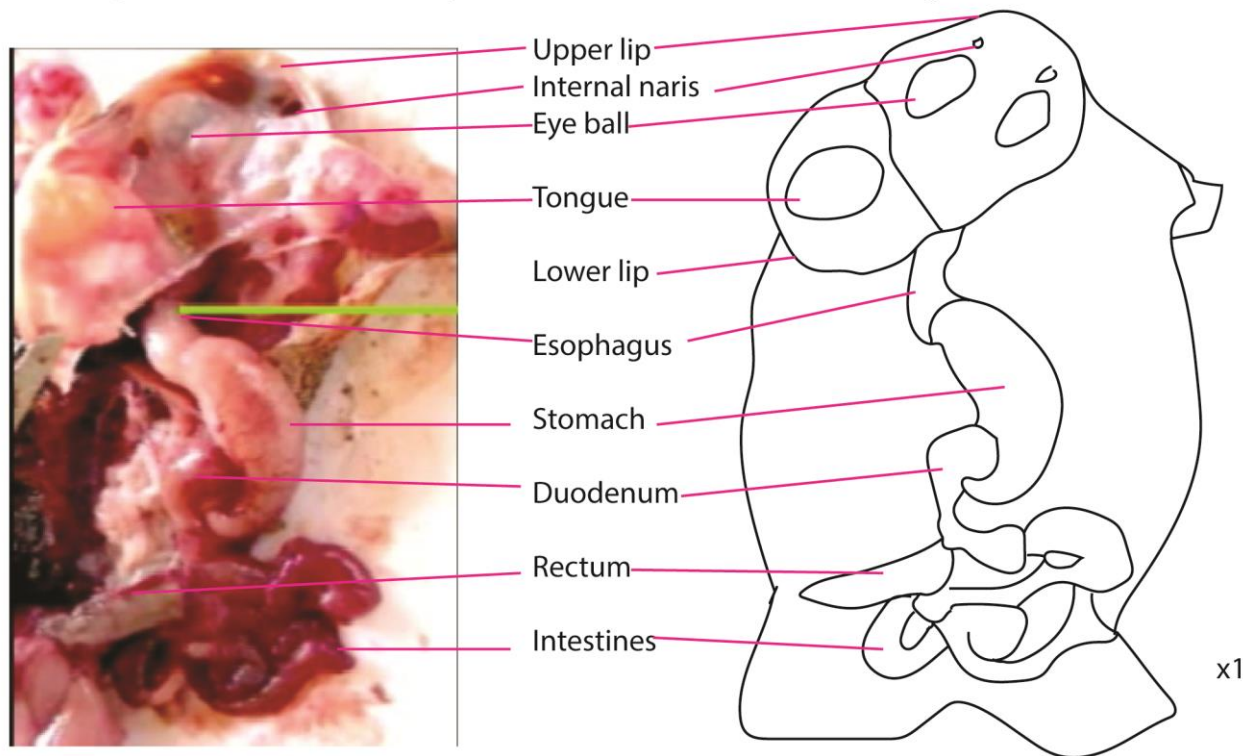
Cut along the left lateral line of the mouth to display the structures in the buccal cavity. Draw and label the alimentary canal and the structures that facilitate digestion of food.

*\*This question is similar to question 3 except that this time we include structures in the buccal cavity that aid digestion.\**

A drawing of alimentary canal and structures that facilitate digestion in the buccal cavity

Alimentary canal and structures that facilitate digestion in the buccal cavity

A drawing of alimentary canal and structures that facilitate digestion in the buccal cavity



Lips – hold food

Internal naris – smell and distinguish between bad and good food

Eye ball – help to push food into the esophagus

Tongue – taste food

Esophagus – conducts of food from the mouth to the stomach. It is tubular to allow passage of food and muscular to push food by peristalsis. It is elastic to allow big food particles to pass.

Stomach – digests food. It is muscular to pound food and releases digestive enzymes. It is enlarged to store food.

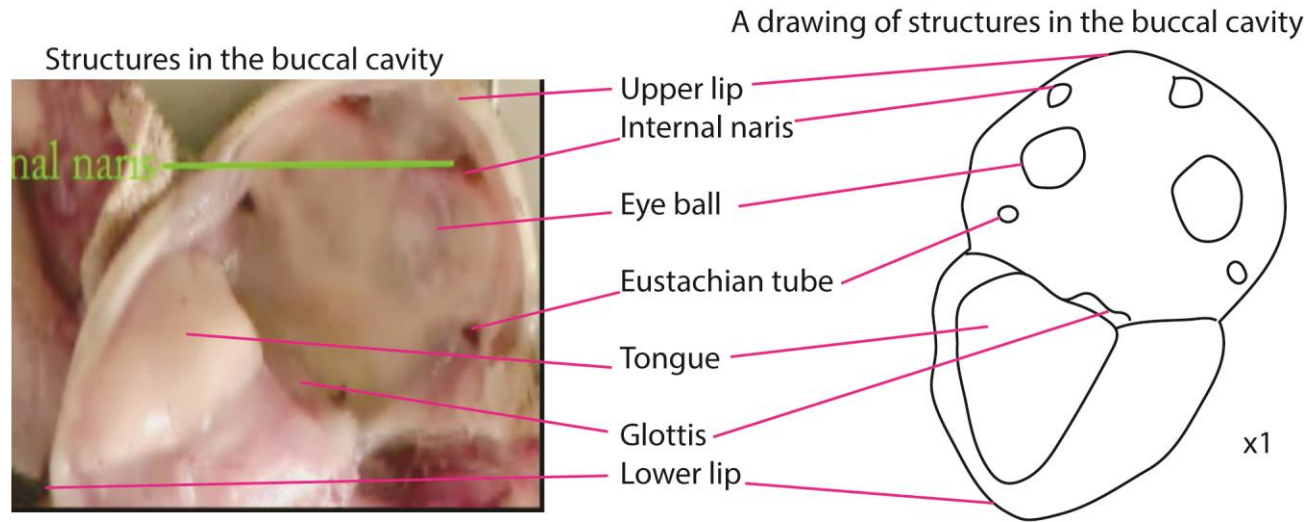
Duodenum – digests food. Muscular to pound food and releases digestive enzymes

Intestines – digest and absorb food. Long to increase the surface area for digestion of food.

Rectum – absorbs water from feces food and also stores feces. It is elastic to store feces.

### Question 5

Open the mouth to expose the structures in the buccal cavity and draw.



### Blood circulation

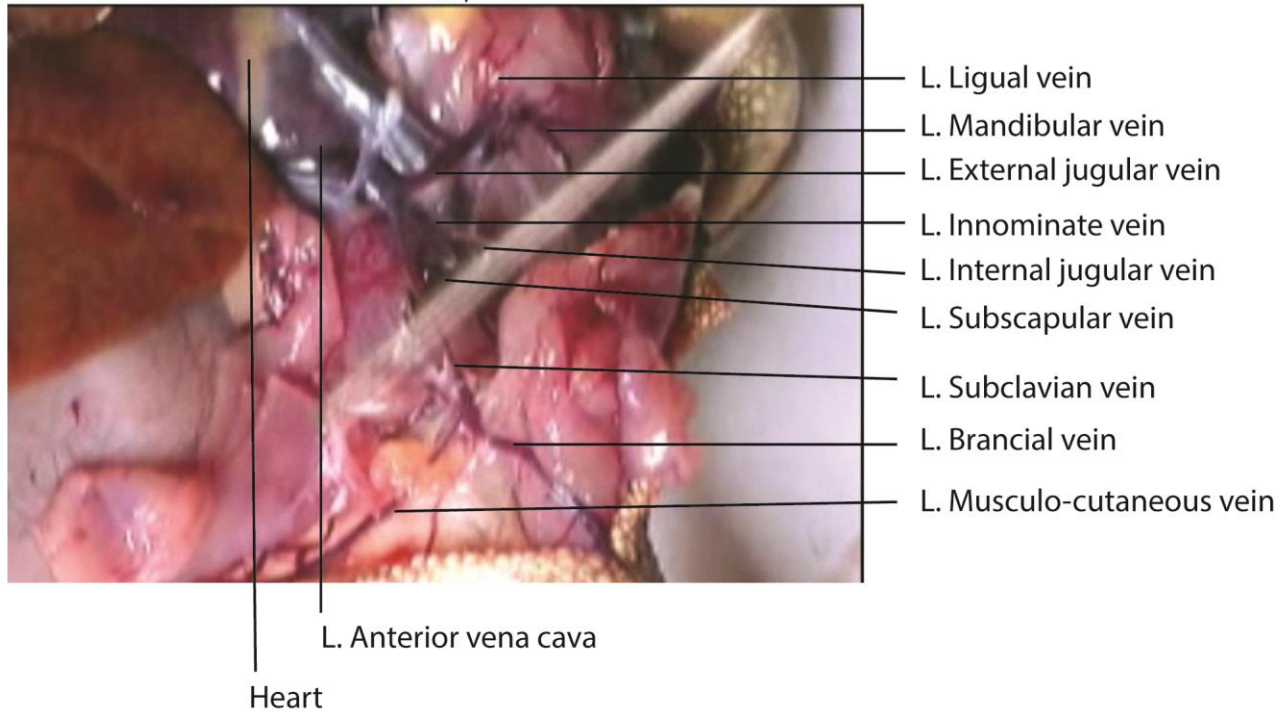
Note that

- (i) Blood vessels that drain the body called veins
- (ii) Blood vessels that supply the body are called arteries
- (iii) When drawing blood vessels; major blood vessels should be bigger than branches and the end of blood vessels should be closed.
- (iv) When required to draw blood vessels to or from given organs, the specified organs should be drawn even if they are not blood vessels just to show the relationships.

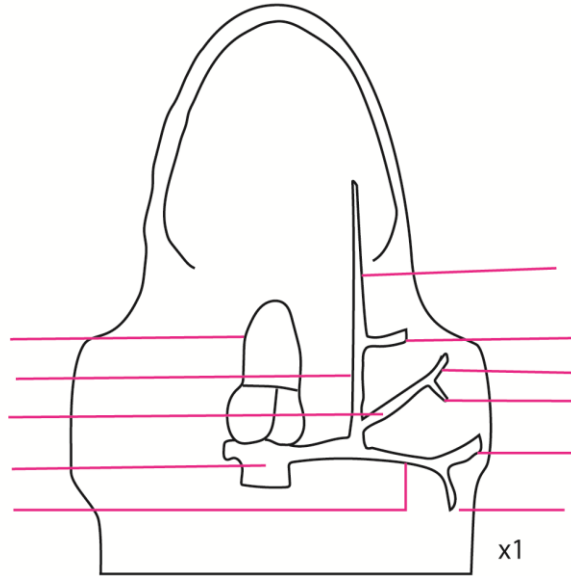
### Question 6

Dissect to expose blood vessels that drain the head, left fore limb and the skin. Draw.

Blood vessels that drain the head, left fore limb and the skin



A drawing of blood vessels that drain the head, left fore limb and the skin

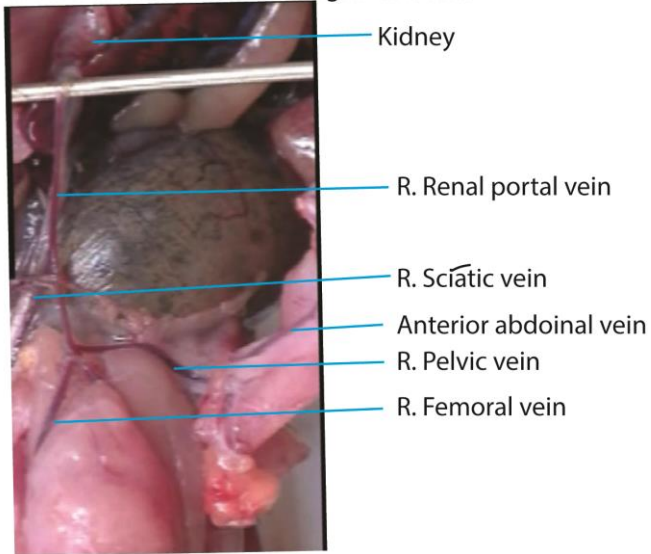


Please label and memorize

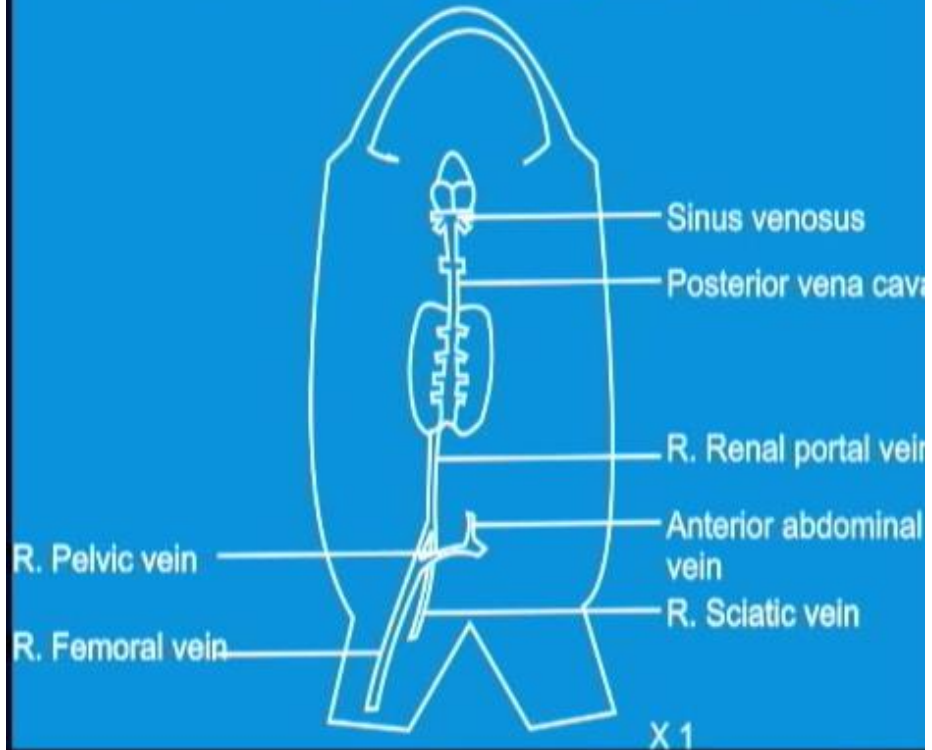
### Question 7

Dissect the toad to expose blood vessels that drain the right hind limb back to the heart displaced anteriorly. Draw and label your dissection

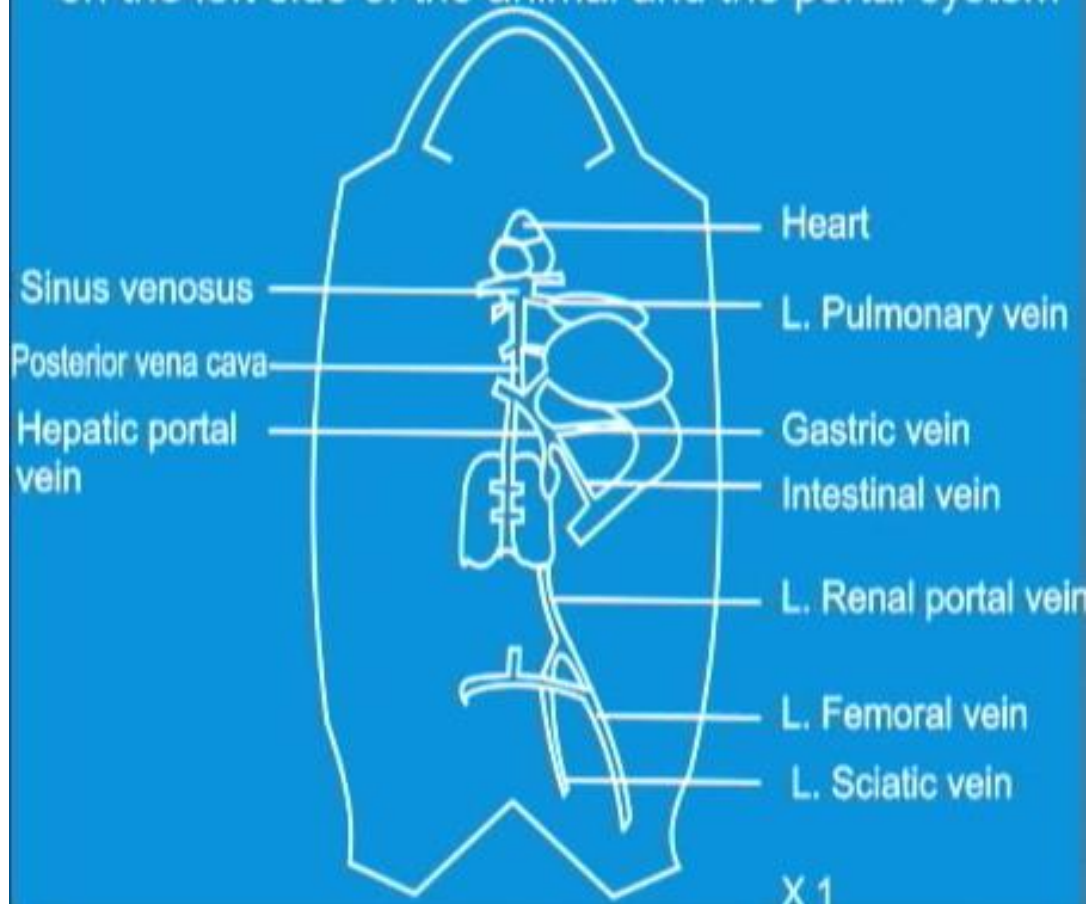
Blood vessels that drain the right hind limb



A drawing of blood vessels that drain the right hind limb back to the heart displaced anteriorly



A drawing of blood vessels that drain the structures on the left side of the animal and the portal system

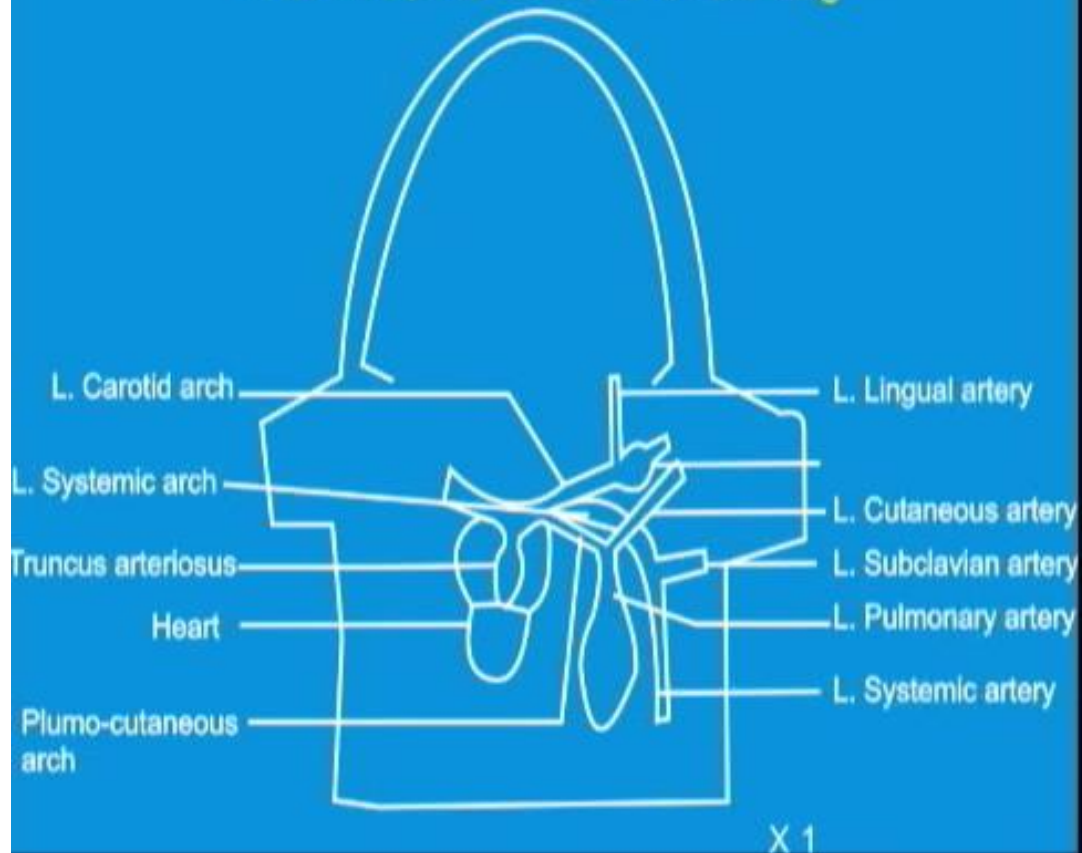


A drawing of blood vessels that drain the body

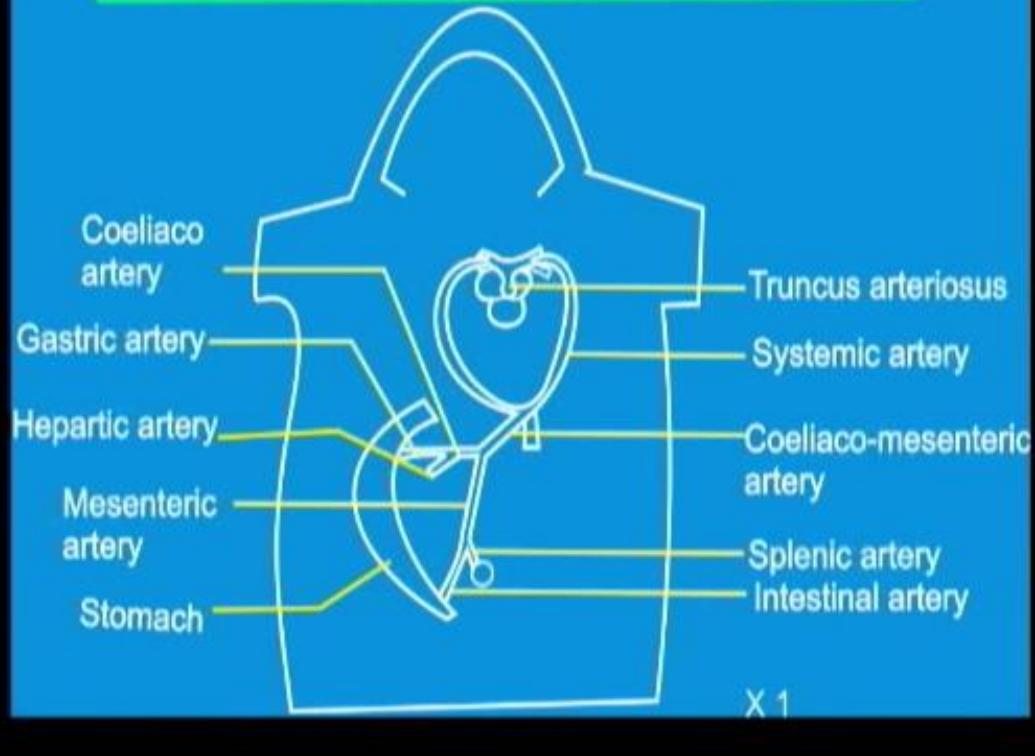


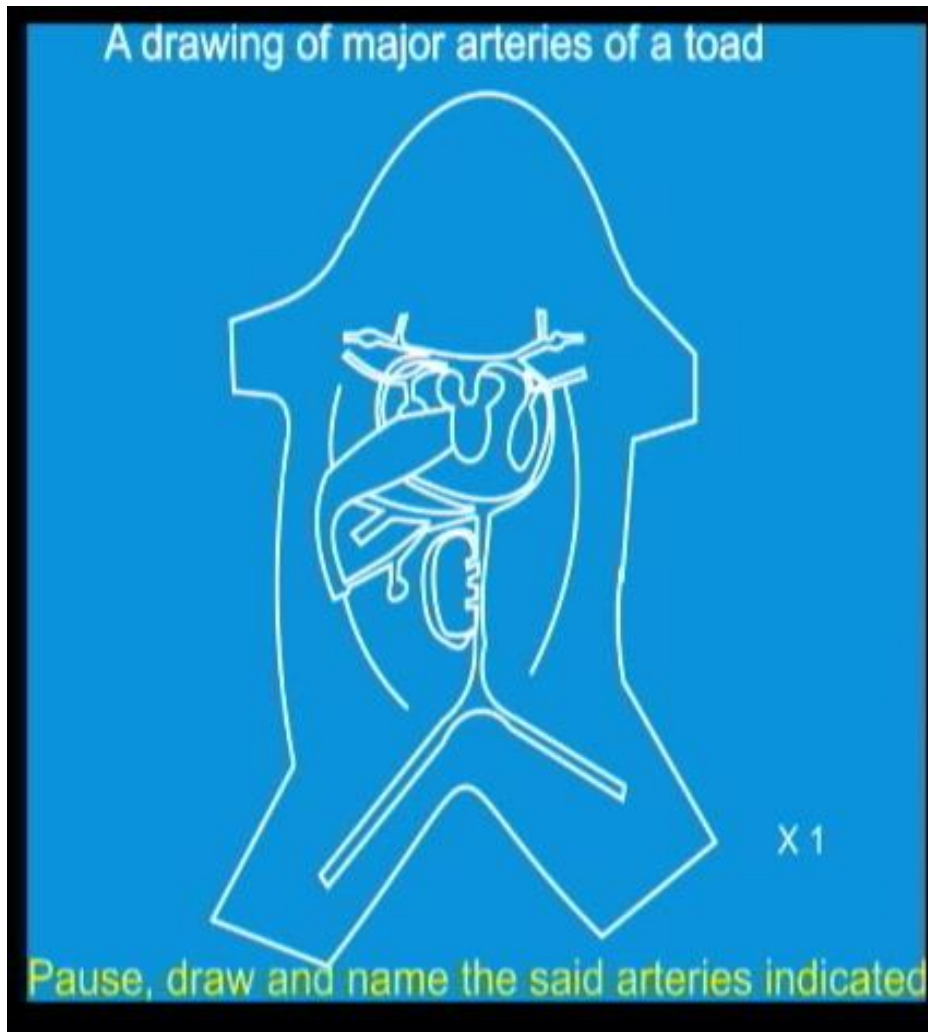
Pause, draw and name the vein indicated

A drawing of blood vessels that supply the left fore limb, the head and left lung



A drawing of blood vessels that supply the digestive system and associated organs





Usually Examination questions do not involve one system but a mixture of them. What is important is to get familiar with all systems before exams. Then read and internalize the question before doing it.